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AN ASSESSMENT OF HERITAGE PROPERTY VALUES USING MULTIPLE REGRESSION ANALYSIS: GEORGE TOWN, PENANG ISLAND MALAYSIA

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ABSTRACT

The aim of this paper was to estimate the value of heritage property using multiple regression analysis. The original dataset consists of 311 Pre-war Shophouses transacted from 2004 to 2018 in Northern-Eastern of Penang Island, Malaysia. After filtration process, only 248 units of Pre-war Shophouses heritage property were available and valid to be used. Three functional forms such as linear, semi-log and log-log have been constructed and their statistical performances have been compared. The results indicate that log-log functional form performed better than the other functional forms in predicting the price of heritage property.

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Keywords: *Heritage property, Multiple regression analysis, Linear regression, Price prediction*

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INTRODUCTION

Nowadays there are numerous organizations from the private sector to the public sector that have show an interest in heritage property Mohd Isa et al., (2011); Said et al., (2013), one of it is the valuation of heritage property. The most important part in valuation is to determine the appropriate method to value heritage properties. Heritage is the past legacy to be passed to future generations along with tangible and intangible value. Due to that, several countries in Asia and Europe have carried out a few steps in protecting and preserving the heritage property (Meskell, Liuzza, & Brown, 2015).

The valuation of heritage property has faced numerous challenges from time to time. The consideration factors within valuation of heritage property and other types of assets are dissimilar, such as limited number of transaction (Yusof, Mui, Meng, & Fern, 2007). The compulsory characteristics of heritage property could be different based on the condition types of heritage, purpose of valuation, location of heritage and parties conducting the valuation (Musa & Yusoff, 2009).

Heritage property is divided into two categories which are public belongings and private belongings Lu et al., (2019); Schuler et al., (2015). The most popular method used in valuing the public heritage is the contingent valuation method (CVM) which is labelled as stated preference (SP) group (Mohamad, Ismail, & Rosdi, 2014). Meanwhile, speaking of the current practice for the private heritage property in Malaysia, in general practitioners use the comparison approach, but the constraints of this approach are limited number in market evidence and recent period of transaction.

The objective of this paper, researchers are required to use method of Multiple Regression Analysis (MRA) using Statistical Package for the Social Science (SPSS). This is to solve the issue of limited market evidence of public and private heritage. However, certain problems may arise during the data processing if independent variables of dataset are not enough to run the regression model using the statistical tool. The limited transaction of heritage property is because the heritage property trade does not frequently occur. Therefore to overcome this thin market issues Mohamad, (2012) has proven with samples of 50 observations that can be conducted by using

MRA. Moreover, Van et al., (2007) has mentioned in their studies that at least 30 samples are needed to carry out this method. Hence this study is aimed to value the Pre-war Shophouses in George Town using MRA by applying three functional forms to identify the best model in MRA within the limited market evidence.

LITERATURE REVIEW

Valuation of Heritage Property

Valuation is one of the important activities in the safeguarding and conservation process of anything related to cultural heritage. Even though it is important but practitioners still do not have enough studies on heritage property assessment because of inadequate market transaction involving this type of unique property (Mohamad, 2014). The valuation term has different purpose and implication, it is based on philosophy, practitioners' valuation, purpose of valuation and the practice of valuation. Other researchers also have drawn attention on the importance of understanding the differences between market valuation and economic valuation in heritage property (Díaz-Andreu, 2017; Mohamad et al., 2014; Ruijgrok, 2006). Table 1 shows the main aspects between market valuation and economic valuation.

Table 1: Main aspects between Market Valuation and Economic Valuation

No	Main aspects	Market Valuation	Economic Valuation
1	Purpose of valuation	Transaction (sale and purchase, rates, lease, tenancy, acquisition)	Conservational
2	The philosophy	Resource of consump-tion for the benefit of individual	Resource of preparation and management for society
3	Valuation prac-titioners	Valuer (The in-charge person in carry out valuation)	Economists
4	Categories of heritage property	Grade I, Grade III (transacted) Private heritage property	Grade I (non-transacted) Public' heritage property

Source: Mohamad et al.,(2014)

Elements Affecting Heritage Property Value

Generally, the features affecting property value are size of property, locality of property and asset condition. For the heritage property valuation, Mohamad et al., (2014) have questioned the features of historical characteristic which influence the property price. Ruijgrok (2006) also highlighted that there are no studies on the features that influence the heritage property price. As mentioned by Mohamad et al., (2017), there are a few of factors influencing the values of heritage property, which can be separated into four categories which include characteristics involving transaction, structural, location and historical. The table below shows the factors affecting the values of heritage property.

Table 2: The Factors Affecting the Influencing the Property Price

Characteristics	Explanation
Transaction-related	The price of heritage property will be used as depend-ent variable. As stated by Royal Institution of Chartered Surveyors, sale prices are the most consistence data source, widely been used and most exposed in the open market. Besides that, other items related during transaction are land/building tenure status, date of val-uation, building position, lot number and building num-ber.
Structural	The data of structural property were obtained from the evidence of sales price, the example of structural of assets for this heritage property are size of lot, main floor area, roof material, types of floor, types of ceiling, building improvement, building material and property maintenance. To ensure the condition structural of property, a site inspection was carried out to confirm all these structural characteristics condition including any new renovation.
Historical	This study adapted the historical characteristics list studies by Ruijgrok, (2006) on heritage property which used to be hedonic as pricing model development. The examples of historical characteristics are architectural style, ensemble, façade status and authenticity. These historical characteristics were classified as factors af-fecting the heritage property prices (Mohamad, Ismail, & Iman, 2017).

Source: Mohamad et al., (2017) & Ruijgrok, (2006)

Table 3: List of Features Affecting the Value of Heritage Property

Heritage Property Characteristics	Features
Transaction-related	•Freehold/Leasehold •Year of Valuation •Position •Lot Number •Title Number •Building Number •Road •Share
Structural	•Main Floor Area •Building Improvement •Roof Material and Building Material •Types of Floor and Ceiling •Maintenance inside and Maintenance outside.
Historical	•Façade Status •Ensemble •Authenticity.
Location	•Street Name

Source: Theriault et al., (2003), Sayce, (2009), S. Lu et al., (2017), Shinde et al., (2018) & Guo at al., (2019)

The Method that have been used in Valuing Heritage Property

To understand what has been studied from the previous gathered information which are linked to this study, researchers have provided the illustration below. Figure 1 outline the previous studies on the approach used in valuing heritage property.

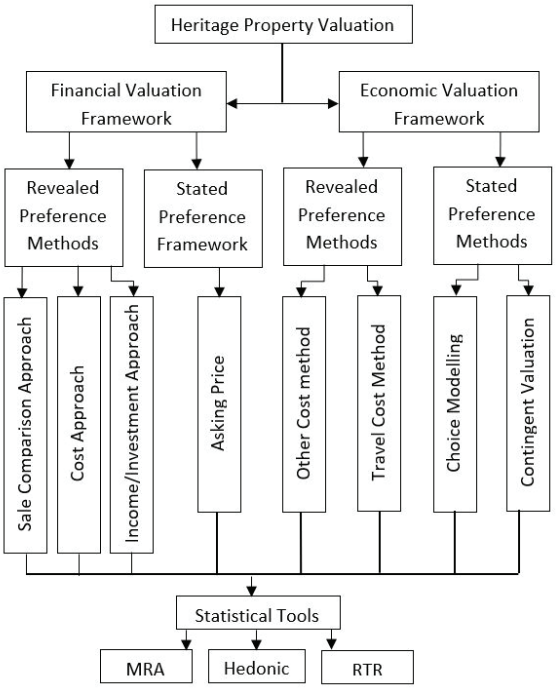

Figure 1: The Methods used in Valuing the Heritage Property
Source: Author

The International Valuation Standards (2017) has stated three principles of valuation approaches to be used in heritage property valuation which include sale comparison, cost approach and income approach. According to Mohamad et al., (2015), the most preferred method used by Malaysian Valuers is sale comparison approach in valuing private heritage property. Valuers realized the limitation of the comparison method but due to the absence of other alternatives, they had to use it, besides a lack of dataset to be use as evidence in measuring the accuracy of the result. Therefore, this study used MRA in valuing the Pre-war Shophouses in George Town, Penang.

The state of Penang comprises Penang Island and Seberang Perai whereas George Town is the state capital which is located on Penang Island. In George Town, there are two zones which are core zone and buffer zone, the private pre-war shophouse were located randomly in core zone and buffer

zone. In addition, there are 4 types of heritage property as mentioned by UNESCO located in George Town, the types include Category I, Category II, Replacement and Infill.

Table 4: The Classification of Heritage Property

Classification of Heritage Property	Types of Properties
Category I	Monuments, objects and sites which should re-main as originally.
Category II	Buildings, granite pathways and sites of special interest.
Replacement	An existing building with non-significant which can get permit to make any re-development.
Infill	An existing empty land or temporary building structure which compatible with re-development is permitted.

Source: George Town World Heritage Incoperated (2016)

Dealing with heritage or antique property is a challenge to Valuers due to its condition. The depreciation condition of heritage property may affect the value of heritage property, moreover heritage property have their own policy to protect and preserve their value. MRA is an extension of the comparison method of valuation, it describes and evaluates the relationship between different variables. In MRA statistical method, there are three functional forms to identify the significant variable which influences the price of the heritage property. The variables in MRA are separated into two, which are dependent variable Y (property price) and independent variable X (property characteristics).

RESEARCH METHODOLOGY

The secondary data of heritage property transaction were collected from National Property Information Centre (NAPIC) and George Town World Heritage Incorporated (GTWHI) in digital form. The data contained record of 3121 of pre-war shophouse commercial property transactions in George Town from 2004 to 2018. Over 15 years, only 248 (223 in-samples and 25 out-samples) transactions of Pre-war Shophouses were involved. Hence, this property is classified as special property based on the limited transaction in sale and purchase. During the filtration of data process, the features of heritage property are considered to improve the available data.

Table 5 shows the filtration process of heritage property original data from 2004 to 2018, at the end of filtration only 248 observations of Pre-war Shophouses were selected to develop the MRA model.

Table 5: The Record of Data Cleaning Process

No	Notes	Number of records left
1	Original data from 2004-2018 for Pre-war Shophouse in Penang received from NAPIC	3121
2	Excluding properties not inside of core zone and buffer zone.	311
3	Excluding share	260
4	Excluding lot size	253
5	Excluding number of storey	248

Source: NAPIC (2019)

Table 6 : Descriptive Statistics of Final Dataset

Variables	Minimum	Maximum	Mean	Std. Dev	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error
Road_ Name	1.0	15.0	6.883	3.6974	.323	.163
Zone	0	1	.49	.501	.045	.163
Storey	1	3	2.01	.201	1.479	.163
Syer	1	1	1.00	.000	.	.
Year	2004	2018	2009.78	2.576	.680	.163
Year_ Dummy	1	14	9.22	2.566	-.705	.163
Lot_Size	33.000	1408.000	229.91452	205.04793	2.984	.163
Lot_Size_ Log	3.496507	7.249925	5.191170	.667056	.410	.163
Price	38000	7500000	1194591.1	1167690.9	2.605	.163
Price_Log	10.545341	15.830413	13.644121	.836928	-.023	.163

Source: Author

RESULT AND DISCUSSION

This section assesses and estimates the value of the Pre-war Shophouses in George Town, Malaysia as a case study which used MRA.

Table 7 : The Result of Pairwise Correlation Matrix

		Road_ Name	Zone	Storey	Year	Lot_ Size	Lot_ Size_ Log	Price	Price_ Log	Year_ Dummy
Road_ Name	Pearson Correlation	1	-.577**	-.004	-.053	.357**	.282**	.278**	.267**	.056
	Sig. (2-tailed)		.000	.953	.428	.000	.000	.000	.000	.406
Zone	Pearson Correlation	-.577**	1	-.021	-.030	-.225**	-.252**	-.188**	-.161*	.028
	Sig. (2-tailed)	.000		.757	.657	.001	.000	.005	.016	.675
Storey	Pearson Correlation	-.004	-.021	1	-.064	-.044	.018	.153*	.174**	.064
	Sig. (2-tailed)	.953	.757		.343	.514	.785	.022	.009	.340
Year	Pearson Correlation	-.053	-.030	-.064	1	-.050	-.086	.412**	.458**	-1.000**
	Sig. (2-tailed)	.428	.657	.343		.462	.203	.000	.000	.000
Lot_ Size	Pearson Correlation	.357**	-.225**	-.044	-.050	1	.879**	.615**	.534**	.050
	Sig. (2-tailed)	.000	.001	.514	.462		.000	.000	.000	.461
Lot_ Size_ Log	Pearson Correlation	.282**	-.252**	.018	-.086	.879**	1	.568**	.592**	.085
	Sig. (2-tailed)	.000	.000	.785	.203	.000		.000	.000	.206
Price	Pearson Correlation	.278**	-.188**	.153*	.412**	.615**	.568**	1	.857**	-.412**
	Sig. (2-tailed)	.000	.005	.022	.000	.000	.000		.000	.000
Price_ Log	Pearson Correlation	.267**	-.161*	.174**	.458**	.534**	.592**	.857**	1	-.458**
	Sig. (2-tailed)	.000	.016	.009	.000	.000	.000	.000		.000
Year_ Dummy	Pearson Correlation	.056	.028	.064	-1.000**	.050	.085	-.412**	-.458**	1
	Sig. (2-tailed)	.406	.675	.340	.000	.461	.206	.000	.000	

Source: Author

Pairwise Correlation Matrix

For this study, there is no multicollinearity for the result based on the variables. From table 7 above, it shows the pairwise correlation matrix.

Variance Inflation factors (VIF)

In order to detect multicollinearity, the popular method which has been adapted is VIF. The studies by Brien (2007), has stated that the value below 10 is indicated as low multicollinearity, meanwhile Des et al., (2000); Theriault et al., (2003) has pointed out that values below 5 is low multicollinearity. On the other hand, the studies from Ismail (2005); Ruijgrok (2006), have stated there is no theoretical basis in detecting the value of multicollinearity between 5 or 10. Thus, this study has adopted 10 as the value in detecting the multicollinearity.

Choice of Functional Form

The property market is classified as heterogeneous; the price of property is influenced by several variables. In order to use MRA as a statistical model, this study has deliberated three functional forms which are linear, semi-log and log-log to determine which functional form fits and explains the dataset. The method entered for linear regression contained 224 (in-samples) of Pre-war Shophouses, the dependent variable is price and for the independent variable are road name, core zone, storey, year dummy and lot size.

The Performance of Three Functional Forms

Table 8 below shows the result of linear, semi-log and log-log for MRA model. The chosen functional form is log-log, because the result shows it has the highest Adjusted R^2 with 66.8% compared to linear with 61.4% and semi-log with 57.6%.

Table 8: The Functional Form Linear

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-390055.444	533076.211		-.732	.465
Road_Name	31332.254	16808.807	.099	1.864	.064
Zone	59711.543	119007.833	.026	.502	.616
Storey	1227007.358	242413.583	.211	5.062	.000
Year_ Dummy	-210349.168	19040.293	-.462	-11.048	.000
Lot_Size	3517.084	253.797	.618	13.858	.000

Source: Author
a. Dependent Variable: Price
Adjusted R^2 61.4%
SE 722835.116
F 72.467
MSE 3.786E+13

Table 9: The Functional Form of Semi-Log

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	12.463	.402		31.034	.000
Road_Name	.032	.013	.141	2.512	.013
Zone	.100	.090	.060	1.114	.266
Storey	.965	.183	.232	5.285	.000
Year_ Dummy	-.166	.014	-.509	-11.574	.000
Lot_Size	.002	.000	.533	11.376	.000

Source: Author
a. Dependent Variable: Price_Log
Adjusted R^2 57.6.4%
SE .5445671255
F 61.471
MSE 18.230

Table 10: The Functional Form of Log-Log

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	9.193	.430		21.356	.000
Road_Name	.045	.011	.198	4.113	.000
Zone	.212	.080	.127	2.646	.009
Storey	.835	.162	.201	5.168	.000
Lot_Size_ Log	.765	.051	.610	14.975	.000
Year_ Dummy	-.175	.013	-.538	-13.759	.000

Source: Author
a. Dependent Variable: Price_Log
Adjusted R^2 66.8%
SE .4825079784
F 90.183
MSE 4.661

The Best Functional Forms of MRA Model

Based on the analysis of functional forms of MRA, the best result of analysis is log-log MRA model. Thus, this functional form is selected for observation data to estimate the predictive value. The equations for log-log MRA are:

The log-log MRA model is specified as:
MV = 9.193 + (0.835*Storey) - (0.175*Year_Dummy) + (0.045*Road_Name) + (0.212*Zone) + (0.765*Lot_Size_Log)

Where;
MV is indicated as market value
Storey is indicated as level building of Pre-war Shophouses
Year_Dummy is indicated as year the transacted heritage property
Road_Name is indicated as the location of heritage property area
Zone is indicated as the area of heritage property inscribed by UNESCO

Furthermore, in classifying the well prediction models that reflect this study, the well performed model have been applied for in-sample and out-sample observations. Table 8 shows the result of the MAPE's log-log of the MRA referred to types of analysis in-sample and out-sample. As shown in Table 8, the average MAPE values of the log-log MRA is 14.04% for in-sample and 44.79% for out-sample. The formula of MAPE is calculated by:

$$MAPE = \frac{\text{Extimate Price-Actual Price}}{\text{Actual Price}} \times 100$$

MAPE is a parameter to measure the size of error in percentage term. As stated by Joslin (2006);Brown et al., (2011), the parameter of sale price within the estimation value should not least ±5% to???? ±10%. Based on the result the values of MAPE for out-sample is higher than ±10% the in-sample of MAPE values. It shows that the model of in-sample is better than out-sample because the percentage values is different.

Table 9: The Result of MAPE Values of Log-Log MRA for in-sample Analysis

No	Road's Name	Price (Actual Price of transaction) (MYR)	Price Log-log MRA (MYR)	MAPE values (log-log MRA) (MYR)
1.	Lebuh Chulia	3650000	15.11	-9.26
2.	Lebuh Penang	1600000	14.29	98.40
3.	Jalan Argyll	1100000	13.91	164.97
4.	Masjid Kapitan Keling	3250000	14.99	-42.60
5.	Jalan Hutton	2700000	14.81	92.40
6.	Lebuh Campbell	2400000	14.69	-18.30
7.	Jalan Argyll	848000	13.65	39.22
8.	Lebuh Pantai	588000	13.28	50.24
9.	Lebuh Chulia	5500000	15.52	-32.25
10.	Lebuh Campbell	3500000	15.07	-48.32
11.	Lebuh King	2700000	14.81	-38.49
12.	Masjid Kapitan Keling	1500000	14.22	-26.69
13	Lebuh Carnarvon	1200000	14.00	39.81
14	Lebuh Acheh	1001000	13.82	-8.48
15	Lebuh Pantai	1000000	13.82	103.84

16	Lebuh Muntri	7500000	15.83	-30.15
17	Lebuh Campbell	3500000	15.07	-56.62
18	Lebuh Campbell	2930000	14.89	-48.01
19	Jalan Hutton	2600000	14.77	-0.65
20	Lebuh Campbell	2250000	14.63	-46.40
21	Jalan Argyll	1850000	14.43	-26.13
22	Lebuh Campbell	1780000	14.39	-32.25
23	Lebuh Victoria	1560000	14.26	7.86
24	Lebuh Acheh	1200000	14.00	-36.18
25	Lebuh Campbell	1200000	14.00	-38.72
26	Lebuh Kimberley	1200000	14.00	18.25
27	Masjid Kapitan Keling	600000	13.30	-31.60
28	Lebuh Chulia	550000	13.22	-14.36
29	Masjid Kapitan Keling	530000	13.18	-22.57
30	Lebuh Carnarvon	249000	12.43	45.88
31	Lebuh Farquhar	6173805	15.64	-0.25
32	Lebuh Farquhar	5931695	15.60	-0.15
33	Lebuh Muntri	3800000	15.15	-54.46
34	Lebuh Muntri	3200000	14.98	-45.10
35	Lebuh Muntri	3000000	14.91	-55.88
36	Lebuh Muntri	2800000	14.85	-40.88
37	Lebuh Muntri	2720000	14.82	-48.21
38	Lebuh Muntri	2500000	14.73	-31.31
39	Lebuh Muntri	2200000	14.60	-40.49
40	Lebuh Leith	2200000	14.60	-12.98
41	Lebuh Pantai	1700000	14.35	-29.62
42	Lebuh Carnarvon	1600000	14.29	-16.96
43	Lebuh Victoria	1450000	14.19	-48.22
44	Lebuh Campbell	1335000	14.10	-39.52
45	Lebuh Campbell	1335000	14.10	-39.52
46	Lebuh Campbell	1330000	14.10	-40.03
47	Lebuh Acheh	1250000	14.04	-9.12
48	Jalan Argyll	1100000	13.91	4.29
49	Lebuh Campbell	1100000	13.91	-43.88
50	Lebuh Penang	1000000	13.82	19.50

51	Lebuh Carnarvon	1000000	13.82	18.22
52	Lebuh Penang	979000	13.79	57.21
53	Lebuh Leith	960000	13.77	-2.09
54	Lebuh Acheh	787000	13.58	38.69
55	Lebuh Pantai	770000	13.55	62.27
56	Lebuh Chulia	750000	13.53	8.22
57	Lebuh Chulia	750000	13.53	9.51
58	Lebuh Carnarvon	610000	13.32	-14.07
59	Lebuh Farquhar	6173805	15.64	-16.27
60	Lebuh Farquhar	5931695	15.60	-16.18
61	Lebuh Penang	3700000	15.12	-33.36
62	Lebuh Victoria	2300000	14.65	-32.96
63	Lebuh Muntri	2000000	14.51	-44.45
64	Lebuh Kimberley	1725000	14.36	14.88
65	Lebuh Campbell	1700000	14.35	-36.85
66	Lebuh Campbell	1550000	14.25	-49.47
67	Lebuh Muntri	1370000	14.13	6.58
68	Jalan Hutton	1100000	13.91	65.47
69	Lebuh Carnarvon	985000	13.80	13.24
70	Lebuh Pantai	900000	13.71	11.60
71	Jalan Argyll	900000	13.71	-8.05
72	Lebuh King	850000	13.65	18.99
73	Lebuh Acheh	790000	13.58	20.71
74	Lebuh Acheh	790000	13.58	20.71
75	Lebuh Muntri	720000	13.49	42.47
76	Lebuh Acheh	710000	13.47	34.31
77	Lebuh Acheh	700000	13.46	30.89
78	Lebuh Campbell	650000	13.38	4.92
79	Lebuh Chulia	500000	13.12	40.32
80	Jalan Argyll	500000	13.12	41.63
81	Masjid Kapitan Keling	450000	13.02	-35.74
82	Lebuh Chulia	3000000	14.91	-41.84
83	Lebuh Farquhar	1538095	14.25	182.14
84	Lebuh Farquhar	1461905	14.20	185.51
85	Masjid Kapitan Keling	1423680	14.17	1.42

86	Masjid Kapitan Keling	1423680	14.17	1.42
87	Masjid Kapitan Keling	1423680	14.17	1.42
88	Masjid Kapitan Keling	1423680	14.17	1.42
89	Lebuh Pantai	1100000	13.91	60.85
90	Lebuh Pantai	1100000	13.91	60.85
91	Lebuh Victoria	960000	13.77	34.83
92	Lebuh Kimberley	785000	13.57	-2.15
93	Lebuh King	550000	13.22	52.60
94	Lebuh Chulia	500000	13.12	21.84
95	Lebuh Chulia	450000	13.02	27.10
96	Lebuh Chulia	450000	13.02	28.62
97	Lebuh Pantai	410000	12.92	18.56
98	Lebuh Carnarvon	300000	12.61	34.22
99	Lebuh Pantai	280000	12.54	73.61
100	Lebuh Pantai	250000	12.43	86.30
101	Lebuh Pantai	250000	12.43	86.30
102	Lebuh Carnarvon	207049	12.24	292.81
103	Lebuh Carnarvon	207049	12.24	292.81
104	Jalan Argyll	2350000	14.67	17.47
105	Jalan Argyll	2350000	14.67	17.47
106	Lebuh Muntri	1500000	14.22	-30.71
107	Lebuh Muntri	1500000	14.22	-30.71
108	Masjid Kapitan Keling	1397662	14.15	-28.44
109	Masjid Kapitan Keling	1397662	14.15	-28.44
110	Masjid Kapitan Keling	1397662	14.15	-28.44
111	Masjid Kapitan Keling	1397662	14.15	-28.44
112	Lebuh Pantai	1200000	14.00	-40.05
113	Lebuh Pantai	1200000	14.00	-40.05
114	Lebuh Campbell	1200000	14.00	-42.75
115	Lebuh Campbell	1200000	14.00	-42.75
116	Lebuh Muntri	1000000	13.82	53.93

117	Lebuh Muntri	1000000	13.82	53.93
118	Lebuh Campbell	880000	13.69	-14.03
119	Lebuh Campbell	880000	13.69	-14.03
120	Lebuh Muntri	850000	13.65	-7.89
121	Lebuh Muntri	850000	13.65	-7.89
122	Jalan Argyll	835000	13.64	34.30
123	Jalan Argyll	835000	13.64	34.30
124	Lebuh Kimberley	760000	13.54	-8.26
125	Lebuh Kimberley	760000	13.54	-8.26
126	Masjid Kapitan Keling	752338	13.53	-17.12
127	Masjid Kapitan Keling	752338	13.53	-17.12
128	Masjid Kapitan Keling	752338	13.53	-17.12
129	Masjid Kapitan Keling	752338	13.53	-17.12
130	Lebuh Campbell	740000	13.51	-25.41
131	Lebuh Campbell	740000	13.51	-25.41
132	Lebuh King	520000	13.16	35.49
133	Lebuh King	520000	13.16	35.49
134	Lebuh Pantai	505000	13.13	85.17
135	Lebuh Pantai	505000	13.13	85.17
136	Lebuh Muntri	500000	13.12	82.51
137	Lebuh Muntri	500000	13.12	82.51
138	Lebuh Pantai	302000	12.62	76.03
139	Lebuh Pantai	302000	12.62	76.03
140	Lebuh Carnarvon	260000	12.47	30.01
141	Lebuh Carnarvon	260000	12.47	30.01
142	Lebuh Pantai	250000	12.43	5.49
143	Lebuh Pantai	250000	12.43	5.49
144	Lebuh Pantai	229500	12.34	73.35
145	Lebuh Pantai	229500	12.34	73.35
146	Lebuh Pantai	225250	12.32	79.65
147	Lebuh Pantai	225250	12.32	79.65
148	Lebuh Pantai	204000	12.23	89.97
149	Lebuh Pantai	204000	12.23	89.97

150	Lebuh Muntri	125000	11.74	625.71
151	Lebuh Muntri	125000	11.74	625.71
152	Jalan Hutton	1897500	14.46	-33.27
153	Lebuh Campbell	1800000	14.40	1.08
154	Lebuh King	1800000	14.40	-63.40
155	Lebuh King	1800000	14.40	-63.40
156	Lebuh Chulia	1440000	14.18	-43.58
157	Jalan Argyll	1400000	14.15	-64.80
158	Lebuh Muntri	1200000	14.00	-32.24
159	Lebuh Penang	900000	13.71	-15.08
160	Lebuh Campbell	760000	13.54	-14.76
161	Lebuh Muntri	750000	13.53	16.32
162	Lebuh Muntri	750000	13.53	16.32
163	Lebuh Muntri	750000	13.53	15.16
164	Lebuh Muntri	730000	13.50	-14.55
165	Lebuh Muntri	730000	13.50	-14.55
166	Masjid Kapitan Keling	650000	13.38	-64.90
167	Lebuh Penang	650000	13.38	-11.51
168	Lebuh Penang	650000	13.38	-11.51
169	Lebuh Chulia	550000	13.22	-24.54
170	Lebuh Victoria	510000	13.14	-20.82
171	Lebuh Muntri	500000	13.12	53.21
172	Lebuh Muntri	500000	13.12	52.30
173	Lebuh Muntri	500000	13.12	52.30
174	Lebuh Muntri	420000	12.95	54.79
175	Jalan Argyll	420000	12.95	16.55
176	Lebuh Carnarvon	410000	12.92	-15.74
177	Lebuh Victoria	324827	12.69	37.48
178	Lebuh Victoria	324827	12.69	37.48
179	Lebuh Victoria	275173	12.53	43.03
180	Lebuh Victoria	275173	12.53	43.03
181	Lebuh Victoria	260000	12.47	24.90
182	Lebuh Chulia	1700000	14.35	-13.12
183	Lebuh King	1400000	14.15	-60.49
184	Lebuh Chulia	1200000	14.00	17.62

185	Lebuh Penang	1000000	13.82	-55.77
186	Lebuh Penang	750000	13.53	-38.93
187	Lebuh Penang	725000	13.49	-15.42
188	Lebuh Penang	600000	13.30	-11.44
189	Jalan Argyll	590000	13.29	-18.94
190	Lebuh Pantai	590000	13.29	40.16
191	Lebuh Muntri	550000	13.22	6.76
192	Lebuh Penang	550000	13.22	-8.32
193	Lebuh Acheh	500000	13.12	23.88
194	Lebuh Carnarvon	500000	13.12	10.78
195	Lebuh King	485000	13.09	-2.41
196	Lebuh Kimberley	460000	13.04	47.72
197	Lebuh Campbell	450000	13.02	-11.38
198	Lebuh Kimberley	450000	13.02	10.35
199	Lebuh Carnarvon	390000	12.87	-5.33
200	Lebuh Carnarvon	320000	12.68	-9.37
201	Lebuh Carnarvon	320000	12.68	-9.37
202	Lebuh Pantai	38000	10.55	89.98
203	Lebuh Farquhar	3750000	15.14	-44.73
204	Lebuh Farquhar	3750000	15.14	-27.97
205	Masjid Kapitan Keling	1200000	14.00	-50.70
206	Lebuh Penang	1100000	13.91	-8.12
207	Lebuh King	1000000	13.82	-53.57
208	Lebuh Campbell	920000	13.73	-51.52
209	Lebuh Penang	800000	13.59	-48.05
210	Lebuh Pantai	710000	13.47	3.29
211	Lebuh Penang	700000	13.46	-0.66
212	Lebuh Muntri	600000	13.30	3.99
213	Lebuh Muntri	600000	13.30	3.99
214	Lebuh Penang	600000	13.30	-32.45
215	Lebuh Muntri	550000	13.22	10.11
216	Lebuh Campbell	400000	12.90	-28.93
217	Lebuh Muntri	380000	12.85	29.72
218	Lebuh King	300000	12.61	33.26
219	Jalan Argyll	250000	12.43	42.59

220	Jalan Argyll	230000	12.35	16.57
221	Lebuh Carnarvon	190000	12.15	9.51
222	Jalan Argyll	160000	11.98	64.43
223	Lebuh Victoria	380000	12.85	9.19
Average of MAPE values for MRA				14.04%

Source: Author

Table 10: The Result of MAPE Values of Log-Log MRA for in-Sample Analysis

No	Road's Name	Price (Actual Price of transaction) (MYR)	Price Log-log MRA (MYR)	MAPE values (log-log MRA) (MYR)
1.	Lebuh Chulia	2250000	14.63	2.15
2.	Lebuh Chulia	2250000	14.63	3.13
3.	Lebuh Pantai	2050000	14.53	39.89
4.	Lebuh Chulia	1908000	14.46	1.32
5.	Lebuh Penang	1760000	14.38	63.38
6.	Lebuh Pantai	1150000	13.96	30.09
7.	Lebuh Acheh	880000	13.69	75.26
8.	Lebuh Chulia	668000	13.41	36.06
9.	Masjid Kapitan Keling	600000	13.30	35.62
10.	Lebuh Pantai	130000	11.78	506.79
11.	Lebuh Chulia	5200000	15.46	37.17
12.	Lebuh Chulia	3100000	14.95	-43.71
13.	Lebuh Muntri	2800000	14.85	28.44
14.	Masjid Kapitan Keling	1421631	14.17	-1.63
15.	Masjid Kapitan Keling	1418613	14.17	-1.58
16.	Masjid Kapitan Keling	1359756	14.12	-0.59
17.	Jalan Hutton	868000	13.67	142.22
18.	Jalan Argyll	750000	13.53	80.32
19.	Jalan Argyll	700000	13.46	100.12
20.	Lebuh Chulia	495000	13.11	54.14
21.	Lebuh Chulia	5500000	15.52	-48.10
22.	Lebuh King	2850000	14.86	-31.53
23.	Lebuh Chulia	2600000	14.77	-24.65
24.	Lebuh Acheh	1800000	14.40	-3.86

25.	Jalan Argyll	848000	13.65	39.22
Average of MAPE values for MRA				44.79%

Source: Author

Table 11: The Summarize an Applicability of MRA in valuing Heritage Property Value

No	Criteria	MRA
1.	Adjusted R^2 Square of best model	66.8%
2.	MSE	4.661
3.	The best functional form	Log-log
4.	MAPE value of in-sample	14.04%
5.	MAPE value of out-sample	44.79%

Source: Author

FINDINGS

This study is aimed at identifying the best functional model in MRA. The best functional form of MRA is log-log, it shows the adjusted R^2 as the highest besides mean of squared error (MSE) as the lowest between the functional forms. From the findings of best model, the significant variables that have been indicated in the log-log model are road name, zone, storey, lot size log and year dummy.

CONCLUSION

As cited by Mohamad et al., (2015) most Valuers in Malaysia prefer to use sale comparison methods in valuing private heritage because there is no standard valuation to value heritage property in Malaysia. The challenge of this method is limited evidence of transaction besides no guidelines on heritage items to be considered for heritage property in Malaysia. Due to the weaknesses of this traditional method of valuation, Mohamad et al., (2017) have carried out the statistical model of MRA in studies with small datasets. However, the issues of limited market evidence of heritage property still could not solve the unexpected consequences of the limited data. The result of this analysis shows that the functional form of MRA model of log-log is better than linear and semi-log which can shows the better result than

the others to be consider. Hence, from the result researcher cannot easily make a direct comparison of MRA because these models have different performance of functional form. For future suggestion, other statistical tools could help run the small dataset in a better way and clarify suitable variable that can improve dataset.

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